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RATING ERRORS OF INCONSISTENCY AS A FUNCTION

OF DIMENSIONALITY OF BEHAVIORAL ANCHORS

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The present study focuses upon rating errors of inconsistency in multi-dimensional behavior-specific rating scales used for purposes of performance appraisal. The hypothesis that rating scales which are more nearly unidimensional will result in fewer rating errors of inconsistency was tested using a Mixed Standard Rating Scale developed for police supervisory personnel. Two measures of unidimensionality were used. The correlations between the indices of unidimensionality and rating incon-

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sistency across ten rating dimensions were significant and in the predicted
direction, confirming the hypothesis. The implications of the results
for behaviorally anchored rating scales are discussed.

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1.

RATING ERRORS OF INCONSISTENCY AS A FUNCTION
OF DIMENSIONALITY OF BEHAVIORAL ANCHORS[1]

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Blanz (Note 1) introduced a new multidimensional rating scale for-
mat called the Mixed Standard Rating Scale (MSS). Since its introduc-
tion it has been researched by Blanz and Ghiselli (1972), Arvey and
Hoyle (1974), Saal and Landy (1977) and Finley, Osburn, Dubin, and Jen-
erret (1978). Claims of low levels of halo and leniency have been
made with the use of the scale by Blanz and Ghiselli (1972) and Saal
and Landy (1977). As with a behaviorally anchored rating scale (BARS),
performance dimensions are identified and behavioral anchors are devel-
oped to represent high, medium and low levels of each of the dimensions.
All of these anchors are then mixed and presented to the rater in a
random order. The rater is asked to indicate whether the ratee is
"better than," "the same as," or "worse than" each of the anchors. After
all of the ratings are completed, the pattern of responses made by a
rater on the three anchors of each dimension are examined and assigned

a score according to a system proposed by Blanz and Ghiselli (1972).
One of the advantages of using this format is that the scoring is not
obvious to the rater. The rater is thus presumably forced to read each
of the anchors rather than ignoring them and just marking a point along
a vertical continuum. A MSS was developed in the present study for the
evaluation of police supervisory performance.

With the use of MSS's a new type of rating error can be detected
called the inconsistency error. By examining a rater's three responses
to the anchors of a performance dimension, it is possbile to detect
logical inconsistencies. For example, in Table 1 the anchors which we
used to represent high, medium, and low levels of the dimension of
Report Writing are illustrated. If an individual were to be rated by
his supervisor as better than the anchor representing a high level of
report writing then it would be an error of inconsistency for that in-
dividual to also be rated by the supervisor as worse than the medium
or low anchors of report writing. This type of analysis is similar to
what has been referred to in the scaling literature as a Guttman scalo-
gram analysis (cf. Edwards, 1957). Several researchers have employed MSS
formats for the purpose of evaluating the scalability of their BARS's
(Arvey & Hoyle, 1974; Bernardin, LaShells, Smith, & Alvares, 1976; and
Kafry, Zedeck, & Jacobs, 1976). An examination of the ratings made with
our scale revealed such a large number of these inconsistencies that
further explanation appeared appropriate.

In examining errors of inconsistency, counts can be made of the number
of inconsistencies for the ratings made of each ratee, the ratings made

Table 1

The Set of Anchors Used for the Dimension

Of Report Writing

High   Writes reports that accurately describe the situation.

Writes reports which describe events in chronological order.

Writes reports in a clear and understandable fashion.

Carefully separates opinion from fact in written reports.

Medium   Includes trivial information in written reports.

Writes reports containing incomplete sentences or fragments.

Low   Stretches the truth in reporting what occurred.

Leaves out important details in reports.

by each rater, and the ratings made on each rating scale. Thus ratees may be difficult to rate consistently, raters may rate inconsistently or scales may be difficult to use consistently. An examination of the large number of inconsistencies obtained with our scales indicated that the errors were not limited to any particular subset of ratees or raters. Thus, it was decided to explore the possibility that rating errors of inconsistency may be due to a property of the rating scale itself.

Ideally, the behavioral anchors used to define a performance dimension should modally exemplify that performance dimension and should have a high intuitive loading on it. It was reasoned that if the rater is unclear as to which performance dimension a particular anchor represents, or if the three anchors of a performance dimension appear to be representing different dimensions of performance rather than the same dimension, errors of inconsistency may occur. Therefore, the property of the MSS which we examined was the unidimensionality of the rating scales.

It was hypothesized that there is an inverse relationship between the unidimensionality of the anchors which comprise a rating scale and the number of errors of inconsistency which raters make on a rating scale, such that there are fewer errors made on more unidimensional scales.

METHOD

Job analysis, scale construction, and scale evaluation were carried out as one part of a large performance appraisal project in a mid-Atlantic police department.

Job Analysis

The job analysis stage involved defining the content universe, iden-
tifying performance dimensions, and assigning scale values to the items.
The content universe was defined through interviews with members from all
levels of the organization. Each interviewer developed a large pool of
behavioral items representing specific behaviors of police supervisory
activity. Items were then screened by both the research team and members
of the organization for ambiguity and job relevance.

To identify performance dimensions, the edited pool of items was sub-
jected to a qualitative cluster analysis (Campbell, Dunnette, Arvey and
Hellervik, 1973). That is, the items were sorted into what appeared to
be homogeneous categories. The resulting performance dimensions were
then labelled and discussed with members from the police department. As
a result of this process, the following ten performance dimensions were
agreed upon: Job Knowledge, Teamwork, Judgment and Adaptability, Report
Writing, Dealing with the Public, Initiative and Dedication, Personal
Appearance and Demeanor, Consideration, Structure, and Rating.

Scaling of the items was done by 87 police officers representing all
levels of the organization. They were each asked to judge each of the
items on a five point scale representing a continuum of effectiveness-
ineffectiveness. Mean scale values and standard deviations of these judg-
ments were then computed. Items with standard deviations greater than
1.5 or to which greater than 25% of the sample indicated were inapplicable
to the jobs of sergeant or lieutenant were deleted from the item pool.

Scale Construction

As previously discussed, the rating instrument developed was a MSS.
To construct the scale, the pool of items for each performance dimension
was divided into groups of high, medium, and low scale values. The num-
ber of items chosen to represent each anchor varied from two to five.
Groups of items rather than single items were used as anchors so that
raters would be better able to get a clear idea of the dimension and
level of effectiveness to which each anchor referred. Items were not
included as part of an anchor where the overlap in scale values with an
item anchoring an adjacent level was within two standard errors of the
mean. The resulting 30 anchors (three for each of the ten performance
dimensions) were arranged randomly on the final rating form. The rater's
task was to indicate whether the ratee was better than, the same as, or
not likely to be as good as each of the anchors by placing a mark on a
computerized answer sheet.

Sixty-nine sergeants were rated by 35 lieutenants and 25 lieutenants
were rated by 13 of their superiors. Both sergeants and lieutenants were
rated by only one of their superiors. Several superiors rated more than
one subordinate.

Scale Evaluation

Scale evaluation involved assessing the unidimensionality of each of
the separate rating scales, counting the number of rating inconsistencies
made on each scale, and relating these two measures.

In order to assess the unidimensionality of the scales separate prin-
cipal component analyses (PCA) were conducted for each of the ten rating
dimensions. Principal component analysis is a statistical technique for

describing the distribution of variance in a set of variables. The new
variables or components can be considered as providing a description of
the structure of the original set of variables (Harris, 1975, p. 23).
The principal components thus describe the dimensionality of the set of
variables. These analyses were conducted using as input the effective-
ness judgments of all of the items used to represent a performance dimen-
sion. For example, for the report writing dimension shown in Table 1,
the effectiveness judgments of all eight items in the scale were used in
the PCA.

Two statistics were computed from the information provided by these
PCAs to serve as indices of the unidimensionality of the rating dimensions.
The proportion of variance accounted for by the first principal component
was used as one index of unidimensionality (Index 1). The proportion of
variance accounted for by the principal component rather than the actual
principal component values themselves were used in order to make the diff-
erent PCAs more comparable due to the unequal number of items comprising
each scale. The second index created was the ratio of the first princi-
pal component to the second principal component (Index 2). This index was
designed to explore the possibility of a rival major dimension in the data.
For both Index 1 and Index 2, the greater the value of the index, the
greater the evidence for unidimensionality of the scale.

There are 27 possible rating combinations which a rater may use to
describe a ratee's status on any given rating scale (Saal and Landy, 1977,
p. 24). These combinations are listed in Table 2. Note that seven of
these rating combinations are totally consistent while the remaining 20

Table 2

MSS Error Counting System

Anchors

High	Medium	Low
Consistent Combinations:		
+	+	+
0	+	+
-	+	+
-	0	+
-	-	+
-	-	0
-	-	-
Inconsistent Combinations:		
+	+	0
+	+	-
0	+	0
0	+	-
-	+	0
-	+	-
0	-	+
0	0	-
+	0	+
+	0	-
0	0	0
-	0	-
+	-	+
+	0	0
+	-	0
0	-	0
+	-	-
0	-	-
0	0	+
-	0	0

Note: +   refers to a rating of better than

            0   refers to a rating of the same as

            -   refers to a rating of not likely to be as good as

contain some degree of inconsistency. Each time a rater described a ratee inconsistently on a particular rating dimension this was counted as an error. A count was kept of the number of errors made for each of the ten rating dimensions.

The major hypothesis of the study was tested by correlating this error count with the two unidimensionality indices across the ten rating dimensions.

RESULTS

Table 3 lists the two indices of unidimensionality for each of the ten rating dimensions. The correlation between these two indices is .78. The strength and direction of this relationship was expected due to the non-independence of the two indices.

The ratings of both sergeants and lieutenants were characterized by a large number of inconsistency errors. A total of 95% of the ratings were inconsistent (95.6% for sergeants and 93.2% for lieutenants). The proportion of inconsistent ratings obtained within each of the ten rating dimensions for the ratings of sergeants and lieutenants are presented.in Table 4. These were computed by dividing the number of errors made on each dimension by the total number of ratings made on that dimension.

The intercorrelations between the two indices of unidimensionality and the error counts for sergeants and lieutenants are shown in Table 5. All correlations are significant and in the predicted direction. A negative correlation denotes the fact that the higher the index of unidimensionality, the fewer the number of inconsistencies.

Table 3

Unidimensionality Indices for Each of the Ten Rating Dimensions

Rating Dimension	Index 1	Index 2
Report Writing	.470	.151
Initiative and Dedication	.438	.203
Consideration	.369	.165
Rating	.354	.138
Dealing with the Public	.337	.145
Personal Appearance and Demeanor	.315	.128
Structure	.304	.139
Job Knowledge	.296	.131
Judgment and Adaptability	.288	.115
Teamwork	.268	.107

Table 4

Proportion of Rating Errors of the Ratings of Sergeants and Lieutenants

For Each Rating Dimension

Rating Dimension	Sergeants	Lieutenants
Job Knowledge	.97	.96
Teamwork	1.00	.96
Judgment and Adaptability	1.00	1.00
Report Writing	.86	.80
Dealing with the Public	1.00	.92
Initiative and Dedication	.80	.84
Personal Appearance and Demeanor	.99	.92
Consideration	.97	1.00
Structure	.97	.92
Rating	1.00	1.00

Table 5

Correlations Between Unidimensionality Indices and Rating Errors

For the Ratings of Sergeants and Lieutenants

	Sergeants	Lieutenants
Index 1	-.84***	-.72**
Index 2	-.80***	-.69*

Note.   N = 10.

*p <.02 one-tail

**p <.01 one-tail

***p <.005 one-tail

DISCUSSION

The major hypothesis of the study was confirmed. It was found that the consistency with which raters are able to use multidimensional behavior-specific rating scales is positively related to the unidimensionality of those scales.

In considering this result it should be kept in mind that the statistical assessments of unidimensionality are based upon judgments of stimuli made during the developmental stages of the instrument while the measure of rating inconsistency is based upon the data obtained from actual ratings of people made with the scales. Thus, the result represents a relationship between two very different types of measurements.

Two major features of the results should be discussed. First, it should be noted that the study was concerned with the relative levels of unidimensionality of the separate scales rather than absolute levels. Just how acceptable the levels of unidimensionality are was not a prime concern. The study demonstrates that the relative degree of unidimensionality of the scales is related to the relative consistency of raters' use of the scales.

Second, the ratings of the present study contained a large number of inconsistencies. Ninety-five percent of the ratings were inconsistent. Several possible explanations can be offered.

Based upon the major result of the study, the most obvious explanation is the level of multidimensionality of the scales. However, just how multidimentional the scales are is difficult to judge without comparative data.

Post hoc analyses suggest that the use of groups of items as anchors may have contributed to the large number of inconsistent ratings. It was hoped that the use of groups of items would serve to better define the anchors than would the presentation of single items. However, the inclusion of a number of items to anchor each level of a dimension may have increased the difficulty of using the rating scales. The correlations between the total number of items used in the anchors of a scale and the number of errors of inconsistency in rating with that scale are significant (r = .63, p <.05 for sergeants, r = .78, p <.01 for lieutenants, two-tailed tests). Furthermore, the number of items in a scale may contribute to the dimensionality of each scale. A post hoc analysis of the correlation between the number of items anchoring a scale and the uni-dimensionality indices suggests a possible relationship (r = .62, p <.10 for Index 1; r = .47, p <.20 for Index 2, two-tailed tests).

Another possible reason for the large number of inconsistencies is the fact that behavioral items rather than general trait-like items were used for the anchors. Concern for the appropriateness of behavior-specific anchors in MSS's was raised by Finley, Osburn, Dubin and Jeanneret (1977). They stated that the MSS responses "are not appropriate for behaviorally specific anchors presented to the rater out of scale context." (p. 660) Their concern appears to be that a specific anchor by itself does not reveal an adequate amount of information for the rater to be able to identify the rating dimension to which the anchor applies.

The question of how non-unidimensionality might be related to errors of inconsistency in MSS's may be explained by examining in detail the

rating process itself. Ratings on a MSS presumably require a series of several cognitive processes. After reading a behavioral anchor, the rater must identify both the performance dimension and the level of effectiveness which it represents by isolating the performance dimension from other performance dimensions, recalling illustrations of the ratee's behavior relevant to the performance dimension, and then finally, comparing these recalled behaviors to the anchor in terms of level of effectiveness. It is the outcome of this type of complex process which leads to the rater's decision to respond better than, same as, or not likely to be as good as.

Following through with this view of the rating process, if an anchor is multidimensional, it is likely to have multiple meanings for the rater. Thus, the complexity of the cognitive demands of the task (Schneier, 1977) will be greatly increased. It would then be a difficult task for the rater to identify and isolate either the dimension or the level of effectiveness to which the anchor applies leading to difficulties in recalling the relevant ratee behaviors and in comparing these behaviors to the anchor. If the separate anchors of a scale appear to the rater to represent different performance dimensions, inconsistency errors may occur because the rater considers different ratee behaviors relevant when comparing the ratee to each of the anchors.

If multidimensionality leads to an increase in the cognitive complexity of the task, the results of this study may be applicable to other multi-dimensional behavior-specific rating formats such as the BARS. The series of cognitive processes which characterize the MSS and BARS tasks may not differ greatly. Ideally, to use a BARS the rater reads all of the anchors, identifies the appropriate performance dimension, recalls the

relevant ratee behaviors, compares these behaviors to each of the anchors, and then makes the rating by deciding which of the anchors best matches these ratee behaviors. The major difference between the BARS and MSS tasks is that with the BARS the rater is provided with more information. All of the anchors are presented at once with each anchor's physical location on the scale indicating its level of effectiveness. Presumably the rater is thus better able to understand what performance dimension the scale represents and what level of effectiveness is represented by each anchor.

As with the MSS, however, non-unidimensionality of the anchors on a given scale may influence the rating task. If the scale as a whole does not appear to represent a unidimensional continuum, then the rater's task of referring to relevant ratee behaviors and comparing these recalled behaviors to the anchors may be difficult. The rater may be forced to base his or her decision on a general overall impression or to make invalid compromises between different anchors. The BARS procedure provides no way to take note of inconsistency errors. One possible solution to this problem has been to pilot the BARS using a MSS format as was done by Arvey and Hoyle (1974).

The major implication of the study is that since rater's errors of inconsistency are related to properties of the rating scale, researchers interested in constructing multidimensional behavior-specific scales should be checking their rating scales for unidimensionality. One possible statistical technique for doing so is presented.

Another statistical approach would be to use factor analytic tech-
niques. Dickinson and Tice (1977) used a multiple-group factor analysis
of the scale values of their items to identify those items which loaded
unequivocally on a single performance dimension. Through this approach
they were able to reduce the factorial complexity of their rating dimen-
sions. Evidence of increased discriminant validity of the scales was used
to substantiate this claim.

Another approach would be to increase the retranslation criterion
used during scale construction (Smith & Kendall, 1963). This merely
involves the setting of a high level of agreement among the scale construc-
tors concerning which behaviors belong to each of the performance dimen-
sions. However, Kafry, Zedeck, and Jacobs (1976) found that varying this
had no effect on the scalability of their scales.

A third approach to this problem which may be suggested would be to
more closely examine the rating process itself. Introspective reports of
raters might provide useful information concerning the unidimensionality
of the scales.

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